

To The Editor
Med. Times & Gazette
ON THE

PERIOD OF INCUBATION

OF

TYPHUS, RELAPSING FEVER, AND
ENTERIC FEVER.

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THE period of incubation of contagious diseases, or the period that elapses between the entrance of the contagium into the system and the first manifestation of its presence there by symptoms, is not merely a matter of scientific interest, but has many practical bearings, and lies at the bottom of many of the most important sanitary questions. The subject has, nevertheless, not received that attention which it deserves, and practically little is known about it. Authoritative statements based on meagre and unsatisfactory data have been copied by one writer from another, but with regard to most of the contagious diseases there is a want of carefully recorded facts bearing upon the latent period. Even with regard to smallpox, the latent period of which has been most accurately and most frequently observed, a collection of reliable facts is still a desideratum.

The subject is, no doubt, beset with many difficulties, and it is only on very rare occasions that illustrations of the period of incubation of diseases, free from fallacies of all sorts, are met with. Cases throwing light on the latent period of a disease are of a threefold nature :

1. Those in which there has been a single limited exposure to the contagium.

2. Those in which there has been a protracted exposure, both limits of which are known.

3. Those in which there has been a protracted exposure, of which only one limit is known. Either the exposure has persisted from the commencement up to the date of the patient's seizure, in which case it can only be said that the period of incubation has not exceeded the duration of exposure; or an interval of time has elapsed between the cessation of a protracted exposure and the commencement of symptoms, and then it can only be said that the period of incubation has not been less than that interval.

The first class of cases are, no doubt, the best, but the other two classes, to one or other of which most of the recorded instances of latent period of diseases belong, are not without value.

The present communication is intended as a contribution to our knowledge of the period of incubation of the so-called continued fevers of Great Britain, a class of diseases which for many years I had an opportunity of studying on a large scale in the London Fever Hospital. Throughout my active connection with that hospital I was on the constant look-out for cases calculated to throw light upon the subject of this memoir, and I now place on record all such cases as I have encountered out of upwards of ten thousand patients suffering from the continued fevers who have been under my immediate care.

A. TYPHUS FEVER.

(Typhus exanthematicus.)

The following thirty-one observations have reference to the period of incubation of typhus fever.

CASE 1.—Mary H—, æt. 21, was admitted into the London Fever Hospital on April 14th, 1869, having been ill since the morning of the 11th with febrile symptoms. On April 16th the eruption of typhus appeared, and the disease ran its usual course. She was brought to the hospital from 1, Narrow Street, Stepney. The only cases of fever which had occurred in that street for many months before had been four cases also in No. 1. All four patients, however, had recovered upwards of two months before; all four had been young children, and there was evidence that their fever was not true typhus. But on the night of Good Friday, March 26th, Mary H— had set up all night with her brother, who, with his family, was laid up with typhus, and who lived at a considerable distance from Narrow Street. This was the only occasion on which Mary H— had visited her brother's family during their illness; but a sister who resided with her, and who subsequently

contracted typhus, for which she was admitted into the London Fever Hospital, had been repeatedly backwards and forwards between the two houses both before and subsequently to March 26th.

Here the latent period would appear to have been as long as fifteen days. The only fallacy lay in the possibility of the sister having been the vehicle of the poison before she had any symptoms of the disease.

CASE 2.—Dr. B— visited the Fever Hospital in London, and went round the wards with Dr. Buchanan on a certain Saturday. He had not been there before, and he went the same afternoon to Nottingham, where true typhus was not known to prevail. He remained well till the following Thursday week, when he shivered and fell ill with typhus, the diagnosis being verified by Dr. Buchanan.

The latent period in this case was exactly twelve days.

CASE 3.—Emma B—, æt. 60, resided at the "Surrey Arms," Kennington. There had been no cases of illness in the house, and no typhus in the immediate neighbourhood, and she was in comfortable circumstances. On March 7th, 1869, she visited her daughter-in-law, who resided in Walnut Tree Walk, Kennington, and who, with her family, was ill with fever. This was the only occasion on which she visited them during their illness. On March 11th the daughter-in-law and two of her children were brought to the Fever Hospital, ill with typhus. On March 19th Emma B— was taken ill, and on the 22nd she was brought to the hospital, also suffering from typhus with the characteristic symptoms. The disease ran the usual course and terminated favorably.

Here, again, the latent period was exactly twelve days.

CASE 4.—Catherine L—, æt. 15, was admitted into the Fever Hospital, suffering from typhus fever, on March 22nd, 1866. She was a servant in a gentleman's family residing in Tavistock Square. No other person was ill in this house, while cases of typhus originating in families of the better class are almost unknown in the practice of the Fever Hospital. But the girl's own family, living in a distant part of London, had been suffering from typhus, though after this became known to her master she was not permitted to visit them. The last occasion on which she had been to see them was on March 5th, but on the 9th her uncle, who had been to visit her father's family, and who was himself in good health, called and spoke to her in the hall of the house in Tavistock Square. On March 17th Catherine L— became feverish, and when brought to the hospital, five days later, she had the eruption of typhus well out.

As it is not probable that the poison was conveyed by the girl's uncle, the period of incubation in this case must also have been exactly twelve days.

CASE 5.—Maria W—, æt. 25, was a nurse in the Middlesex Hospital. She was exposed at intervals to the poison of typhus from cases in the wards during the months of October, November, and early part of December, 1866, but on no occasion was the exposure so intimate and protracted as during the night of the 7th and the morning of the 8th of December, when she leant for many hours over a female typhus patient who miscarried. On December 10th Maria W— was removed to another ward, and after this she was free from all exposure to contagion. On the forenoon of December 20th she had a rigor and became ill, and on the 24th the eruption of typhus appeared.

If, as there seemed good reason for suspecting, Maria W— contracted the fever during the night of the 7th of December, the latent period in this case also was twelve days.

CASE 6.—William O—, æt. 31, a porter in a solicitor's house in Bedford Row, was admitted into the Fever Hospital on December 24th, 1866, with a medical certificate that he was suffering from typhus. His complaint was acute lichen, not typhus. On December 27th he was discharged from the hospital free from all febrile symptoms. He went home at once to the country to a locality where typhus was not known to prevail, and on January 6th, 1867, he had rigors ushering in an attack of typhus, which lasted a fortnight. When seen by me on January 21st, at his residence in Bedford Row, to which he had been removed, the eruption of typhus was well marked.

Here there could be no doubt that the typhus was contracted in the Fever Hospital, and the period of incubation must, therefore, have been somewhere between ten and thirteen days.

CASE 7.—David W—, æt. 48, was admitted into the Fever Hospital on January 8th, 1868, certified to be suffering from typhus. He remained for two nights in the typhus ward, and was then transferred to another ward, in which there were no cases of an infectious nature, as he had no fever (pulse 72 and temperature normal), and his complaint appeared to be a slight attack of articular rheumatism. On the 21st he had severe shiverings, lasting for two or three hours, and followed by heat of skin, loss of appetite, and other febrile symptoms, and on January 28th by a distinct typhus rash. On February 4th he died.

The period of incubation in this case was somewhere between eleven and thirteen days.

CASE 8.—Mary T—, æt. 19, was admitted as an inmate of the Magdalen Hospital, Blackfriars Road, on March 2nd, 1865. For four nights previously she had slept at "Carter's Refuge," Southwark Bridge Road, whence cases of typhus were brought at the time to the Fever Hospital. There were no cases of illness in the Magdalen Hospital, but eleven days after Mary T— entered it, March 13th, she first felt ill. She became chilly, lost her appetite, and could not sleep, and ten days later, on March 23rd, she was brought to the Fever Hospital with well-marked typhus, from which on March 28th she was convalescent.

In this case, the period of incubation was between eleven and fifteen days.

CASE 9.—Charlotte L—, æt. 20, was admitted into the London Fever Hospital on December 16th, 1864. The nature of her case being at first doubtful, she was placed at first in the typhus ward, where she remained for six days. Her illness, however, turned out to be, not typhus, but erysipelas of the face. After removal to another ward on December 22nd she had no further communication with typhus patients, and she was quite convalescent, when on January 3rd she was again attacked with pyrexia, which proved to be the commencement of an ordinary attack of typhus.

Here the latent period was not less than twelve days, and might have been as long as eighteen days.

CASE 10.—Mary T—, æt. 28, was admitted into the Fever Hospital on December 18th, 1863, and discharged on January 7th, 1864. From the notes of her case it is

clear that her attack was a mild one of enteric fever, but through some mistake she was permitted to convalesce in the typhus convalescent ward for seven days prior to her discharge. On January 12th she was again taken ill, and on January 20th she was readmitted with a typical attack of typhus including the eruption.

In this case the period of incubation could not have been less than five, and might have been as long as twelve days.

CASE 11.—Elizabeth B—, æt. 20, was a patient in the Fever Hospital with what was noted as “febricula,” from December 26th, 1866, to January 7th, 1867. No other person was ill with fever in the house from which she came. There were some doubts at first as to whether her illness was not a mild attack of typhus, and she remained in the typhus ward all the time she was in the hospital. She was free from fever and quite well when she left on January 7th, but next day she was again taken ill, and on January 20th she was readmitted with maculated typhus.

The latent period in this case might have been only one day, and could not have exceeded thirteen days.

CASE 12.—Frederick H—, æt. 7, was admitted into the Fever Hospital on March 16th, 1869, suffering from enteric fever. He came from a school at Edmonton, whence eight other children were admitted with enteric fever in the same month. On March 25th he was, in my absence, inadvertently transferred to the typhus ward, where he remained till April 11th, when he was seen by me for the first time and ordered back to the enteric fever ward. He was then quite convalescent, but next day (April 12th) he again fell ill with fever, and on April 17th he had a copious typhus eruption.

In this case the latent period must have been somewhere between one and seventeen days.

CASE 13.—Fanny D—, æt. 19, was admitted into the Fever Hospital on November 27th, 1867, and remained in a typhus ward till December 6th, on which day, her ailment having been only febricula and hysterical epilepsy, she was removed to the general ward. On December 15th she was again seized with febrile symptoms, which this time proved to be the commencement of typhus, of which she died.

Here the period of incubation must have been somewhere between nine and eighteen days.

CASE 14.—Ann N—, æt. 18, was admitted into the Fever Hospital from the Camberwell Workhouse on January 6th, 1864. She was then in good health, but came as nurse to an infant suffering from typhus. She continued in good health until January 18th, when she was seized with headache, loss of appetite, and other febrile symptoms, and on January 23rd the eruption of typhus appeared. It ought to be stated that for some time previously cases of typhus had been occurring in the Camberwell workhouse, but Ann N— had not been directly exposed to them, and it is more than probable that she did not contract the disease until she came to the typhus ward of the Fever Hospital, and nursed in her arms an infant typhus patient.

On this view of the case the period of incubation could not have exceeded twelve days. It may have been shorter, but there are no means of determining this, as the exposure to the poison continued up to the date of attack.

CASE 15.—Mary D—, æt. 13, was admitted into the Fever Hospital on February 27th, 1864, on the sixth day of an attack of typhus, the eruption being well out. Her mother and two sisters had been previously, on February 4th and 9th, admitted with typhus. They had resided at 6, Model Houses, Lambeth; but Mary D— had left her home in good health on February 11th to go into service in a family residing at 27, Princes Street, Lambeth, none of whom were ill, and she did not revisit her home before falling ill on February 22nd.

In this case the period of incubation could not have been shorter than eleven days.

CASE 16.—In the autumn of 1868 Joseph C—, æt. 16, was a patient for four weeks in the London Fever Hospital with a mild and somewhat doubtful attack of enteric fever. He was discharged on September 18th, having been up and going about for a week before. There was no evidence of any exposure to contagion after his leaving the hospital, but on September 25th he had an attack of shivering, followed by febrile symptoms and cough, and on October 5th he was readmitted into hospital in a state of high fever, with general bronchitis and the eruption of typhus on his trunk and limbs.

Here the period of incubation was not less than seven days, and, as the fever was probably contracted during the week that the patient was going about the hospital, it probably did not exceed fourteen days.

CASE 17.—Elizabeth K—, æt. 21, came as a nurse to the Fever Hospital on January 24th, 1865. She had not previously been exposed in any way to the poison of typhus fever. She remained well till February 3rd, when she felt chilly and lost her appetite, while the pulse and temperature became elevated. On February 8th the eruption of typhus appeared.

Here the period of incubation could not have exceeded ten days.

CASE 18.—Mary R—, æt. 30, became a nurse in the typhus ward of the Fever Hospital on September 15th, 1866. There was no reason to think that she had been previously exposed in any way to the poison of typhus. She remained well till September 25th, when she was seized with typhus, which ran the usual course.

In this case also the period of incubation could not have exceeded ten days.

CASE 19.—Sarah M—, æt. 30, was admitted into the Fever Hospital on April 12th, 1865, ill three days with typhus, which ran the usual course. On April 3rd, and again on April 9th, she had visited her sister-in-law, who was then a patient with typhus in the Fever Hospital. She had not seen her sister-in-law during her illness except on these two occasions, and she was not aware of having been exposed in any other way to the poison of typhus. She felt quite well when she came to the hospital on the afternoon of the 9th, but after going home she felt sick and vomited, and when brought to the hospital, three days afterwards, she had high fever and the eruption of typhus was appearing.

In this case the period of incubation could not have exceeded six days, and may, as in Cases 23 and 24, have been only a few hours.

CASE 20.—On the afternoon of Sunday, February 1st, 1857, I was seized rather suddenly with my second attack of typhus fever. My first attack had occurred in

Edinburgh in 1847. Both attacks were very severe, and in both the eruption was copious and characteristic. On Tuesday afternoon, January 27th, I had visited the London Fever Hospital to see Dr. Tweedie's patients. There were very few cases of typhus in the hospital at the time, but one of these patients, who had congestion of the lungs, I auscultated by putting my ear to his back without the intervention of a stethoscope. I had not visited the Fever Hospital for several months before, nor did I go there again before I was taken ill, and I was not in any other way exposed to the poison of typhus, which at the time was far from being a prevalent disease in London.

The period of incubation in this case was exactly five days.

CASE 21.—Jane M—, æt. 26, was brought to the Fever Hospital, suffering from typhus, on March 23rd, 1865, at the same time and from the same house as Mary T— (Case 8). She had been an inmate of the Magdalen Hospital for seven weeks, during which time she had not been without the walls. She occupied the bed next to that of Mary T— before the latter was taken ill, and she waited on her from the day she was taken ill (March 13th) till March 17th, when she herself was seized with faintness, chilliness, loss of appetite and fever. No other cases of typhus occurred in the Magdalen Hospital.

In the case of Jane M— the latent period could not have exceeded four days.

CASE 22.—In November, 1863, a family named Harman, consisting of mother, daughter, and six sons, was admitted into the London Fever Hospital, suffering from typhus. The father, who had been taken ill first, had been treated at home. Their house was 70, Granby Street, Waterloo Road, but one of the sons, Thomas, æt. 26, resided at 12, King Street, Lambeth Walk, a locality where, at the time, typhus was not prevailing. He had visited his family at 70, Granby Street, after his father had been taken ill, on two occasions only, viz. on November 8th and 11th. On November 12th he was seized with rigors and sickness, and on November 17th he was admitted into the Fever Hospital with fever and a distinct typhus rash.

The period of incubation in this case could not have exceeded four days, and might have been only one day.

CASE 23.—Samuel H—, a sailor, æt. 26, arrived in the Thames from Quebec on December 27th, 1863. The voyage had occupied twenty-one days, and there had been no illness on board the vessel. On the afternoon of the ship's arrival Samuel H— went to visit his brother, residing at 12, Clarence Street, Rotherhithe, a locality where typhus was at the time very prevalent, and from which many cases had been brought to the Fever Hospital. This was the only occasion on which he had left the ship before taking ill. On the second day after visiting his brother he was seized with headache and pain in the limbs, loss of appetite, and thirst, and, when admitted into the Fever Hospital on January 5th, 1864, his body was covered with a copious typhus eruption.

The period of incubation in this case was exactly two days.

CASE 24.—Ann H—, æt. 49, was admitted as an inmate of the Lambeth work-house on February 22nd, 1865. She had been badly off, but was in good health at the time, and remained so until two days afterwards, the 24th, when she went into

the sick ward, in which lay several patients with typhus, and assisted a nurse in lifting a woman sick with that disease out of bed. She was sensible at the time of an offensive, overpowering smell from the patient, and on the same day, within a few hours, she was seized with chilliness and sickness. Three days afterwards she was brought to the hospital suffering from typhus, with a distinct eruption.

In this case the attack appears to have commenced almost immediately on exposure to the poison, or the latent period did not exceed a few hours.

CASE 25.—Mary C—, æt. 17, a dressmaker, from 67, Newman Street, Oxford Street, was admitted into the Fever Hospital on November 4th, 1867, with typhus fever, the eruption being copious, and the attack altogether a typical one. There had been no other case of fever in the house from which she came, and typhus at the time was not known to be prevailing in the part of London in which Newman Street is situated. The sanitary arrangements of the house were good, and Mary C— had been in comfortable circumstances. Moreover, for several weeks she had not gone any distance from her house, excepting on one occasion, October 30th, when she went to see some friends in Wapping, and spent the day there. There was no evidence that the friends whom she visited were suffering from fever, and so far the case is unsatisfactory; but typhus fever was at the time extremely prevalent in Wapping, whereas it did not exist in the locality where Mary C— resided. On the evening of the same day, after returning to Newman Street, she shivered and became feverish, and she continued ill until the time of her admission into hospital.

This case is not a conclusive one, but if the disease was contracted during the visit to Wapping, as there are grounds for believing, the period of incubation did not exceed a few hours.

In addition to these twenty-four cases, which have for the most part come under my observation at the London Fever Hospital, a few others have been communicated to me.

Dr. T. J. Maclagan, Medical Superintendent of the Dundee Royal Infirmary during a great epidemic of typhus, writes to me that the only fact observed by him which bears with anything like accuracy on the period of incubation of typhus is the following.

CASE 26.—A male, æt. 21, was admitted into the Dundee Infirmary on the evening of the 13th January, 1865, with the usual symptoms of the early days of typhus. As this fever was prevalent at the time, he was put into a typhus ward. But on the night of the 14th, and the fourth day of his illness, he perspired freely, and on the morning of the 15th the febrile symptoms were gone. He was accordingly transferred at once to a general medical ward, and on the 18th he was discharged from the hospital.

On January 26th he again had rigors, followed by febrile symptoms, for which he was readmitted into hospital, where he went through a well-marked attack of typhus. There was no reason to doubt that this man had contracted typhus on the first occasion when he was in the hospital, for though typhus was prevalent at the time, he

had not been near any one suffering from it, except during the two days when he was located in the typhus ward for his attack of febricula.

In this case the period of incubation was not more than thirteen, and not less than eleven, days.

The following cases have been communicated to me by Dr. J. B. Russell, Physician and Superintendent of the City of Glasgow Fever Hospital.

CASE 27.—John G—, æt. 19, was admitted with typhus into the City of Glasgow Parochial Hospital from the North Prison. He had previously lodged in the New Vennel, which was then full of fever, and the pyrexial symptoms set in three weeks after imprisonment.¹

CASE 28.—Mary M—, æt. 26, entered the Glasgow Lock Hospital on October 10th, 1868. She had severe shivering on the 24th, and was subsequently admitted into the Fever Hospital with well-marked typhus.

The latent period in this case was not less than fourteen days.

CASE 29.—On October 11th, 1864, Mrs. W— was sent to the Fever Ward, City Parochial Poorhouse, with well-marked typhus. Her children, who were in good health, were removed on the same day from the infected house to the Poorhouse, where they were kept in quarantine. Of these, Sarah, æt. 9, was seized with pyrexial symptoms on October 24th, and had a well-marked attack of typhus.

The period of incubation was in this case not less than thirteen days.

CASE 30.—Jane, æt. 12, another daughter of Mrs. W—, referred to in the last case, was taken ill with typhus on October 22nd.

Here the latent period was not less than eleven days.

CASE 31.—A boy, John Y—, was discharged from the City of Glasgow Fever Hospital, after an attack of typhus, on January 7th, 1865. He went straight to the house of a companion, Robert M—, in Parliamentary Road, where typhus is rarely seen, and was not then known. He slept in the same bed with his companion on the next four nights, the last being that of January 10th. On the 13th, at 12.50 p.m., Robert M— shivered, and had severe fever, which proved to be the commencement of an attack of typhus.

In this case the period of incubation could not have exceeded five and a half days, and might have been little more than two days.

The period of incubation of typhus fever has been variously fixed by different writers as follows :

¹ See also 'Glasg. Med. Journ.,' xii, 144.

Haygarth (1801) ¹	made it	5 days to 2 months.
Hildenbrand (1810) ²	„	3 to 7 days.
Bancroft (1811) ³	„	1 day to 5 or six months.
Sir W. Burnett ⁴	„	7 to 18 days.
Barker and Cheyne (1821) ⁵	„	a few minutes to 6 weeks.
Sir Henry Marsh (1827) ⁶	„	{ a few hours to as many
	„	{ weeks or months.
Dr. Gregory (1832) ⁷	„	10 days.
Dr. Perry (1836) ⁸	„	never less than 8 days.
Dr. Alison (1844) ⁹	„	very various.
Dr. Copland ¹⁰	„	3 to 14 days.
Huss ¹¹	„	1 to 10 days.
Dr. Peacock (1856) ¹²	„	10 to 14 days.
Do. (1862) ¹³	„	14 to 21 days.
Jacquot (1858) ¹⁴	„	9 to 13 days.
Barrallier (1861) ¹⁵	„	12 to 15 days.

Many of these statements are based upon one or two observations, which in some instances are not detailed, and in others are not quite to the point.

¹ Haygarth, 'On the Prevention of Infectious Fevers,' London, 1801.

² Hildenbrand, 'Ueber den Ansteckenden Typhus,' Wien, 1810. French Transl., 1811.

³ Bancroft, 'Essay on Yellow Fever, with Observations concerning Febrile Contagion, Typhus Fever, &c.,' London, 1811.

⁴ G. Gregory, "Observations on the Incubation of Morbific Germs," 'Lond. Med. Gaz.,' vol. ix, 1832.

⁵ Barker and Cheyne, 'Account of the Fever lately Epidemical in Ireland,' London, 1821.

⁶ Marsh, "Observations on the Origin and Latent Period of Fever," 'Dnb. Hosp. Rep.,' vol. iv, 1827.

⁷ Gregory, see note ⁴.

⁸ Perry, "Observations on Continued Fever in the Glasgow Hospitals," 'Ed. Med. and Surg. Journ.,' vol. xlv, 183.

⁹ Alison, 'Outlines of Pathology and Practice of Medicine,' 1844, p. 426.

¹⁰ Copland, 'Med. Dictionary.'

¹¹ Huss, 'Statistique et Traitement du Typhus,' Paris, 1855.

¹² Peacock, "On the Varieties of Continued Fever and their Discrimination," 'Med. Times and Gaz.,' xiii, 1856.

¹³ Peacock, "On the Recent Epidemic of Fever," 'Lancet,' 1862, ii, 5.

¹⁴ Jacquot, 'Du Typhus de l'Armée d'Orient,' Paris, 1858.

¹⁵ Barrallier, 'Du Typhus épidémique à Toulon,' Paris, 1861.

Of the 31 cases now recorded:

The period of incubation was exactly determined (Cases 1, 2, 3, 4, 5, 20, 23, 24, 25)	. . . . .	in 9
It occurred during a period of which both limits were known (Cases 6, 7, 8, 9, 10, 11, 12, 13, 26, 31)	. . . . .	in 10
It occurred during a period of which only one limit was known—		
<i>a.</i> Highest limit known (Cases 14, 17, 18, 19, 21, 22)	. . . . .	in 6
<i>b.</i> Lowest limit known (Cases 15, 16, 27, 28, 29, 30)	. . . . .	in 6
		—
Total	. . . . .	31
		—

The period of incubation in the 31 cases was as follows:

	No. of Cases.
Not less than 21 days (Case 27)	. . . . . 1
Exactly 15 days (Case 1)	. . . . . 1
Not less than 14 days (Case 28)	. . . . . 1
,, 13 ,, (Case 29)	. . . . . 1
Exactly 12 days (Cases 2, 3, 4, 5)	. . . . . 4
A period of which both limits known, and 12 days within these limits (Cases 6, 7, 8, 9, 10, 11, 12, 13, 26)	. . . . . 9
Not more than 12 days (Case 14)	. . . . . 1
Not less than 11 days (Cases 15, 30)	. . . . . 2
,, 7 ,, (Case 16)	. . . . . 1
Not more than 10 ,, (Cases 17, 18)	. . . . . 2
,, 6 ,, (Case 19)	. . . . . 1
Exactly 5 days (Case 20)	. . . . . 1
Between $5\frac{1}{2}$ and 2 days (Case 31)	. . . . . 1
Not more than 4 ,, (Cases 21, 22)	. . . . . 2
,, ,, 2 ,, (Case 23)	. . . . . 1
None, or only a few hours (Cases 24, 25)	. . . . . 2
	—
Total	. . . . . 31
	—

From the cases now recorded it would seem that the usual period of incubation is about twelve days. Of the nine cases

in which it was exactly determined, in four it was twelve days; and in thirteen more of the thirty-one cases it might have been twelve days. In other words, out of the thirty-one cases, in seventeen the period of incubation was either twelve days or this duration was within the known limits. It may be added that Jacquot, who calculated the latent period from the date of embarkation of healthy French troops on board vessels infected with typhus, found in a considerable number of cases that it varied from nine to thirteen days, the average being somewhat less than twelve days.¹

But occasionally the period of incubation exceeds twelve days. It did so with certainty in four only of the thirty-one cases now recorded. In one only of the cases was there reason to think that it was as long as twenty-one days. Theurkauf records two cases, in one of which it was eighteen days and in the other between fourteen and nineteen days.² Peacock also relates the case of a man who, in 1862, nineteen days after his admission into a surgical ward of St. Thomas's Hospital, was attacked with typhus to which it is believed that he could only have been exposed prior to his admission.³ I know no reliable facts, however, showing that the latent period of typhus can exceed three weeks, and statements to the effect that it can extend over several months require confirmation. Few, at all events, will admit, on the evidence adduced by Bancroft,⁴ that an interval of five or six months may elapse between exposure to the poison and the commencement of the disease, an opinion to which he was forced by his determined opposition to the possibility of an independent origin of the fever.

On the other hand, in not a few cases of typhus the period of incubation is less than twelve days. It was so in ten, at least, of the thirty-one cases now recorded. Davies records the cases of

¹ Jacquot, *op. cit.*, 119.

² Theurkauf, "Ueber Typhus exanthematicus," 'Virchow's Archiv f. Path. Anat. und f. klin. Med.,' Bd. xliii, 1868, s. 40.

³ Peacock, "On the Recent Epidemic of Typhus," 'Lancet,' 1862, vol. ii, p. 5. In reference to this case it may be mentioned that there appears to have been patients suffering from typhus in the *medical* wards at the time, and that under similar circumstances I have known patients in the surgical wards of the Middlesex Hospital attacked with typhus many months after admission, although they were confined to bed, and no communication with the typhus patients could be traced.

⁴ Bancroft, *op. cit.*

four Norwegian sailors, who on the night of their ship's arrival in Bristol from Onega, visited some typhus-fever nests, and all four sickened with typhus eight days after.¹ In my own second attack the latent period was exactly five days (Case 20). There are also authentic instances of an extremely short latent period, or where there has been scarcely any latent period at all. The late Sir Henry Marsh collected nineteen cases in which the disease manifested itself almost instantaneously after exposure to the poison. In most of the cases the persons complained of an offensive odour proceeding from the beds or bodies of the sick, and immediately suffered from headache, great prostration, nausea, or rigors, followed by the usual symptoms of typhus.² Similar cases were mentioned by Haygarth;³ others were observed by Gerhard at Philadelphia in 1836;⁴ and in two of the thirty-one cases now recorded (Cases 24 and 25) there were reasons for believing that the symptoms commenced immediately after the first exposure. In some of these cases it might be difficult to exclude the possibility of previous exposure to the poison, but in others there were no grounds for such suspicion, and in all, the patients appeared to be conscious of the moment at which the poison entered the system. It would seem that the poison of typhus may be so concentrated, or that the system may be so susceptible of its action, that its effect may be almost instantaneous.

From the above facts the following conclusions may be drawn :

1. The period of incubation of typhus varies in duration in different cases.

2. In a large proportion of cases it is about twelve days.

3. In exceptional cases it is longer than twelve days, but it rarely, if ever, exceeds three weeks.

4. In many cases (one third or more) it is less than twelve days, and occasionally there is scarcely any latent period, the

¹ Davies, "The late Epidemic of Typhus in Bristol," 'Med. Times and Gaz.,' Oct. 19th, 1867.

² Marsh, *op. cit.*

³ Haygarth, *op. cit.*, p. 65.

⁴ Gerhard and Pennock, "On the Typhus Fever which occurred at Philadelphia in 1836, showing the Distinctions between it and Dothineritis," 'American Journ. of Med. Science,' 1837, vol. xix, p. 299.

symptoms commencing almost at the instant of exposure to the poison.

B. RELAPSING FEVER.

The following six cases are all that I am able to add to those already on record illustrating the period of incubation of relapsing fever. Only three of the six cases came under my own observation.

CASES 1 and 2.—On October 27th, 1870, a lad, *æt.* 17, who resided in a locality of Glasgow in which relapsing fever was prevalent, had rigors, and in the evening of October 31st he came to his mother's house in Dundee. On the 2nd of November, at mid-day, he was admitted into the infirmary, where his case was diagnosed as a characteristic one of relapsing fever.

On November 16th his two sisters, *æt.* 14 and 16, shivered within a few hours of each other while at work. Both were sent to hospital, where they went through a similar attack to that of their brother's. They had not visited their brother in the infirmary, and there were no other cases of relapsing fever in Dundee at the time. Dr. T. J. Maclagan, of Dundee, to whom I am indebted for these particulars, observes that as these girls went to work at six in the morning, and as they did not see their brother till between six and seven in the evening of October 31st, it follows that the disease was contracted by them between 6 p.m. of October 31st and 6 a.m. of November 2nd.

The period of incubation in these two cases could not have been as long as sixteen days, and must have been at least a few hours longer than fourteen days.

CASE 3.—In June, 1869, a Prussian physician, Dr. Goltdammer, related to me the following circumstances of his own attack. Some months previously he had been in daily attendance on cases of relapsing fever in the Charité Hospital in Berlin. He then travelled 200 English miles into the country to a place where relapsing fever was unknown. Six days afterwards, his appetite and general health having been perfectly good in the interval, he was suddenly seized with vomiting and fever, and this was the commencement of a well-marked attack of relapsing fever with jaundice.

Here the period of incubation could not have been less than six days.

CASE 4.—Ann A—, *æt.* 46, was admitted into the London Fever Hospital on January 21st, 1870, on the seventh day of an attack of relapsing fever. The first crisis had taken place, and the skin was then cool, though slightly jaundiced. But on the 28th she had again rigors, followed by severe pyrexia, which, after four days, subsided suddenly with copious perspiration. This patient had been a nurse in the relapsing fever ward of the Fever Hospital from January 3rd to 12th, and on the latter day she went as a nurse to St. Mark's Hospital for Fistula. She remained well there for three days, but on January 15th she was suddenly seized with shivering, vomiting, and high fever, and was obliged to take to bed.

In this case the period of incubation must have been somewhere between three and twelve days.

By this patient relapsing fever was communicated to a number of persons in St. Mark's Hospital. In two instances the period of incubation seemed to be exactly two days and seven days, and in five others not longer than ten, nine, eight, five, and four days. The details of these cases have been published by Dr. Leared in the '*Lancet*.'

CASES 5 and 6.—Two men, æt. 27 and 42, were admitted into the Fever Hospital, one on December 6th, 1869, and the other on March 10th, 1871, with relapsing fever. They had both arrived in London in good health from the country, one from Portsmouth, and the other from Croydon. They had both slept during the night after their arrival in the Camberwell workhouse, from which many cases of relapsing fever were being sent to the Fever Hospital, and both on the following morning had been attacked with symptoms of the fever.

In both of these cases the period of incubation appeared not to have exceeded a few hours.

The period of incubation of relapsing fever has been variously estimated, but there are few facts for determining it accurately. Cases have been recorded to show that the effects of the poison may be instantaneous; while, on the other hand, the physicians of Silesia in 1847 made the latent period vary from fourteen to twenty-one days.² According to Lebert's observations in the recent epidemic at Breslau, it varies from three to seven days, but was oftener over than under five days, and sometimes extended into the second week.³ During the recent epidemic of relapsing fever several important observations on its latent period have been recorded—in this country by Leared⁴ and Muirhead,⁵ in Germany by Zuelzer⁶ and Wyss and Bock,⁷ and in America by Dr. A. Clark.⁸ These, with the six observations now recorded, and one made by Cormack in 1843,⁹ make in all twenty-five cases, which may be classified as follows:

¹ June 11th, 1870.

² Virchow, "Mittheilungen über die in Oberschlesien herrschende Typhus-epidemie," '*Arch. für Path. Anat.*,' 1849, p. 262.

³ H. Lebert, "Aetiologie und Statistik des Rückfallstypus und des Flecktyphus in Breslau," '*Deutsch. Arch. f. Klin. Med.*,' 1870, p. 469.

⁴ Leared, '*Lancet*,' June 11th, 1870.

⁵ C. Muirhead, "Relapsing Fever in Edinburgh," '*Ed. Med. Journ.*,' July, 1870.

⁶ W. Zuelzer, "Der recurrirende Typhus in St. Petersburg." Being an appendix to his German translation of 'Murchison on the Continued Fevers of Great Britain,' 1867, p. 657.

⁷ Wyss and Bock, '*Studien über Febris recurrens*,' Berlin, 1869, p. 65.

⁸ A. Clark, '*New York Med. Record*,' March 15th, 1870, p. 28.

⁹ Cormack, '*Natural History, Pathology, and Treatment of the Epidemic Fever at present prevailing in Edinburgh*,' 1843, p. 117.

I. Period exactly fixed	9 cases.
9, 7, 5, 5, 4, 2 days ; attack immediate on exposure, 3 cases.	
II. Both limits of period fixed	3 „
Between 3 and 12 days	1 case.
„ 14 „ 16 „	2 cases.
III. One limit only of period fixed	13 „
a. Maximum	10 „
2, 3, 4, 4, 5, 5, 8, 9, 9, 10 days.	
b. Minimum	3 „
6, 6, 9 days.	
	Total, 25 „

These facts, so far as they go, point to the following conclusions :

1. The period of incubation of relapsing fever is not a fixed period, and is even more variable than that of typhus.

2. It is, on the whole, shorter than that of typhus. In not one of the nine cases in which it was accurately determined did it exceed nine days ; in none of the twenty-five was there reason to believe that it exceeded sixteen days ; in only two did it certainly exceed twelve days, and in only three others was it possible for this period to have been exceeded ; while in fourteen of the twenty-five cases, or in more than one half, it did not exceed five days.

3. Occasionally, as in typhus, there is scarcely any latent period at all, the symptoms commencing almost immediately after the first exposure to the poison.

C. ENTERIC FEVER.

(Typhoid or Pythogenic Fever.)

Reliable facts bearing on the period of incubation of enteric fever are even more difficult to obtain than illustrations of the latent period of typhus or relapsing fever. In my own practice I can call to mind only two cases throwing light upon the question, and in these all that could be said was that the period of incubation was not longer, in one case than twenty-one days, and in the other than fourteen days. Medical men of much experience in fever, and among others Dr. J. B. Russell, Superintendent of the City of Glasgow Fever Hospital, and Dr. T. J. Maclagan, formerly Superintendent of the Dundee

Infirmaries, have also informed me that they have met with no cases showing the latent period of enteric fever. Several circumstances contribute to make it very difficult to obtain satisfactory evidence on the point as regards enteric fever:—1. The difficulty in many cases in deciding when an attack of enteric fever really commences. 2. The circumstance that nurses and patients in fever hospitals rarely take enteric fever. 3. The fact that in private practice, when the disease has been imported into a healthy locality, according to my experience it rarely spreads. 4. The difficulty often in determining, when a person is seized with enteric fever soon after changing his residence, whether he has brought the disease with him, or whether he has been predisposed to the disease by recent arrival in an infected locality. In the absence of original observations it may be well to refer briefly to some of the more important recorded facts and opinions on the matter, which are but little known.

Lothholz, a pupil of Gerhardt's, analysed a number of cases observed in villages around Jena, with the following results:

28 days	.	.	.	.	.	.	.	1 case.
26 „	.	.	.	.	.	.	.	2 cases.
23 „	.	.	.	.	.	.	.	2 „
22 „	.	.	.	.	.	.	.	5 „
21 „	.	.	.	.	.	.	.	3 „
20 „	.	.	.	.	.	.	.	5 „
18 „	.	.	.	.	.	.	.	1 case.
Total								19

These cases he picked out of three epidemics as “ganz exact zu bestimmenden Fällen,” and he also gives some probable calculations in nine other cases less certain, but in all of which the latent period was about three weeks. He saw no instances in which it was only a few days, and he concludes that the period of incubation of enteric fever is longer than that of other acute diseases, and is, on an average, about three weeks.¹

Seidel determined the period of incubation in one case, brought from a distance, to be at least twelve days.²

Zehnder, from observations made at Zurich, concludes that

¹ ‘Beitrag zur Aetiologie des Ileotyphus,’ Jena, 1866.

‘Jenaische Zeitschr. f. Med.,’ iv, 480.

the period of incubation is usually between ten and twenty days, but that when there is a strong predisposition it may not be longer than twenty-four or forty-eight hours.¹

De la Harpe has recorded twenty-one observations on the latent period of enteric fever. In none of his cases was the period exactly determined; eight cases showed the minimum duration, and thirteen the maximum. Of the former, in seven cases the minimum duration varied from five to twenty-three days, and in the eighth it was between five and six weeks; of the latter, the maximum duration varied from six days to eleven weeks.²

Dr. W. Budd states that a large number of cases have led him to the conclusion that the latent period of enteric fever ranges from ten to fourteen days.³

In July, 1826, an outbreak of enteric fever occurred in the Military School of La Flèche, in France; 109 boys were attacked. The school was broken up, and the boys who were not ill were sent to their homes in distant parts of France. Twenty-nine of these boys were taken ill with enteric fever some time during the second week after their reaching home.⁴

The following case is remarkable in other ways than as an illustration of the period of incubation of enteric fever. On the evening of May 2nd, 1869, a soldier in the garrison of Homburg fell into the dung-pit of the latrine of the military barrack, and was covered with filth, which also entered his mouth, nose, and ears. *Eight days* after this he felt malaise and lost his appetite, and on the fourteenth day diarrhœa set in. Careful records were made of the pulse and temperature, which left no doubt that the illness was enteric fever. This disease was not epidemic in Homburg at the time; no case of it had occurred in the barracks for upwards of a year before, and none occurred afterwards.⁵

¹ Pamphlet published in 1866. I have been unable to see the original, and am indebted for the reference to it and to the observations of Lothholz and Seidel, to Dr. Clifford Allbutt, of Leeds.

² De la Harpe, 'Recherches sur les divers modes de propagation de la Fièvre typhoïde,' Lausanne, 1867.

³ W. Budd, "Intestinal Fever, its Mode of Propagation," 'Lancet,' 1856, ii, 618.

⁴ Bretonneau, "Notice sur la contagion de la Dothienéntérie," 'Archiv Gén. de Méd.,' sér. i, tom. xxi.

⁵ Knoevenagel, 'Berliner Klin. Wochenschr.,' 8th Nov., 1869.

Dr. Clifford Allbutt has put on record a case in which the period of incubation was exactly four days. A nurse came to her master's house in the early stage of enteric fever. On the night of her arrival, and on that night only, she slept with a little girl of the family. On the next morning the nurse was isolated, but her little bed-fellow fell ill on the fifth day, and had a very severe attack of enteric fever. No other person in the house was attacked, and the house was in all sanitary conditions irreproachable.¹

There are well-authenticated facts, which prove the correctness of Lehnder's opinion, that the period of incubation of enteric fever may be even less than in the case last referred to.

In August, 1829, a drain was opened in a school house at Clapham; it was cleaned out, and its contents spread over a garden adjoining the boys' play-ground. Within four days twenty out of twenty-two boys at the school were attacked with enteric fever in a severe form. The disease was proved to be enteric fever by post-mortem examination of the fatal cases, while the opening of the drain was admitted to be the cause of the outbreak by Drs. Latham and Chambers, and others who investigated the matter.²

Lastly, Professor Griesinger gives the particulars of three cases, one of them his own, in which the illness commenced on the day following exposure to the infection. The following is a translation of the passage in his work referred to:

“Few trustworthy observations have been made on the period of incubation of enteric fever. This much appears to me certain, that it may be very short. I myself fell rapidly ill on the day following the one on which I thought I had caught the infection. I had felt somewhat unwell at the bedside of a female patient suffering from a severe attack of enteric fever, at whose chest I had listened for a long time. A patient in my clinique went to nurse another patient ill with enteric fever, and slept the first night in the patient's room. On the following day she began to sicken with the fever. A man remained for a quarter of an hour in a house where enteric fever was, and in him also the illness commenced next day.”³

¹ ‘Brit. Med. Journ.,’ May 7th, 1870, p. 480.

² “Account of the Disease in Mr. Day's School at Clapham, in August, 1829,” ‘Lancet,’ 1829, xvi, 696; ‘Med. Gaz.,’ vol. iv, 375, 410, 448.

³ ‘Infectionskrankheiten,’ 2nd ed., 1864, p. 149.

From the facts before us the following conclusions may be drawn :

1. The period of incubation of enteric fever is most commonly about two weeks.

2. Instances of a longer duration appear to be more common than in typhus or relapsing fever.¹

3. The period of incubation is often less than two weeks, and, as in typhus and relapsing fever, it may not exceed one or two days.

It would be an interesting inquiry how far the period of incubation varies according as the poison is introduced by the alimentary canal or by the lungs.

¹ With regard to the cases in which the latent period has been reported to extend over many weeks or months, it may be doubted if the disease has not had an independent origin.

POSTSCRIPT.

1. IN an outbreak of enteric fever at Guildford in 1867, investigated by Dr. Buchanan, the latent period in a number of instances appeared to be exactly *eleven days*. The epidemic was restricted with almost absolute precision to the high levels of the town, attacking here the poor and rich alike, but it spared entirely the low lying parts of the town. The only condition generally coincident with the outbreak was the high service of the town water supply ; and it was found that eleven days before the commencement of the outbreak, water polluted with sewage, which had been stored up for sixteen days, had *on one day* been distributed by this service to the 330 houses in which the fever appeared.—*Tenth Rep. of Med. Off. of Privy Council*, p. 34.

2. With regard to the case quoted at page 19 from Dr. Clifford Allbutt, facts have come to my knowledge which had not been communicated to Dr. Allbutt, but which depreciate its value as an illustration of the latent period of enteric fever. The nurse had only left her master's house in Oxford seven days before her return, and two days before she fell ill, and she went to a house in Cheltenham in which there was no fever, while nine days after her return her master's under-nurse also took the fever. There is no proof, then, that the nurse imported the fever from Cheltenham, and more probability that its cause was in Oxford, although careful inquiry failed to discover it.

